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DEPARTMENT OF ENERGY AND RESOURCES MANAGEMENT
WASTE MANAGEMENT BRANCH

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1 ST. CLAIR AVE. W.
TORONTO

FILE REF. No.:

WASTE MANAGEMENT

On March 13th of the present year, the Prime Minister of Ontario announced a significant new approach to the battle against pollution in the Province. Under this policy, pollution control and environmental management are to be concentrated under one Minister in the Department of Energy and Resources Management.

The agencies immediately concerned were two groups of the Department of Health - the Air Pollution Control Service and the Waste Management Section of the Public Health Engineering Service. The former was transferred effective August 1st and is now the Air Management Branch. This article deals with the second development whereby the Waste Management Section has become the Waste Management Branch of the Department of Energy and Resources Management, effective September 1, 1969.

In accordance with the announcement of the Prime Minister, this now brings the several agencies responsible for the three elements of the environment, insofar as pollution control is concerned, under the Minister of Energy and Resources Management - the Ontario Water Resources Commission, the Air Management Branch, and now the Waste Management Branch.

The Waste Management Branch is responsible for the provincial control of storage, collection, transportation, treatment and disposal of all solid wastes and, in addition, all liquid wastes whose ultimate disposal is onto land. Since the improper management of such wastes may result in the pollution of all the elements of the environment - water and air as well as land - the Branch will act as the primary coordinating body for any agencies, such as the Ontario Water Resources Commission or the Air Management Branch, who may also be concerned. The advantages of a single management body to which municipalities and members of the public can refer, rather than a multiplicity of agencies, is obvious. If there are associated problems of water pollution or air pollution these will, of course, be referred to the Ontario Water Resources Commission or the Air Management Branch to be dealt with, if necessary, under their legislation.

Since 1960, the Department of Health has been charged with the responsibility for developing a program of refuse disposal. This is enunciated in Section 6, Paragraph 43 of The Public Health Act. During the course of time, this developed into Section 95 a of The Public Health Act, which was passed by the Legislature in 1967 and was preceded by the formation of the Waste Management Section of the Public Health Engineering Service in June of 1966. A supporting regulation was written and the complete program was at the point of implementation during March of 1969 when the new policy was promulgated.

The change in approach which has been described does not mean that there will be less emphasis on the health aspects. On the contrary, one of the most, if not the most important function of waste management is to ensure that the health and well-being of individuals and of the community as a whole is not impaired.

To this end, it has been agreed between the Public Health Division of the Department of Health and the Waste Management Branch of the Department of Energy and Resources Management, with the concurrence of the Deputy Ministers of each Department, that the participation of the Medical Officer of Health and his staff in waste management should be continued.

Under this scheme, the Medical Officer of Health, through his public health inspection staff, would maintain day-to-day surveillance of waste disposal sites in co-operation with the Waste Management Branch. The close relationship which has been developed between the Local and Regional Health Offices and the Regional Waste Management Engineers will be maintained and strengthened to achieve medical/engineering teamwork. In addition, the opinion of the Medical Officer of Health on the public health aspects of proposed sites will be solicited before examination of the proposals by the Regional Waste Management Engineer.

Under this program, the intrinsic interest of the Public Health Inspector in the local environment will be protected and, indeed, strengthened; a significant co-operation between two departments of government will be achieved; and a great stride forward will have been taken in the continuing battle to combat pollution in the Province of Ontario.

J.D. Heaman, P. Eng., Director,
Waste Management Branch,
Ontario Department of Energy
and Resources Management.

September, 1969.

ONTARIO

DEPARTMENT OF ENERGY AND RESOURCES MANAGEMENT

One St. Clair Ave. West,
Toronto 195, Ontario,
Telephone: 365-6634

October 24, 1969.

MEMORANDUM

The transfer of the Waste Management group from the Department of Health has resulted in the formation of the Waste Management Branch of the Department of Energy and Resources Management.

From time to time, we shall be issuing circulars on general matters of interest within the waste management context and a copy of Bulletin No. 1 is attached.

If you require additional copies or further information, we shall be pleased to hear from you. Alternatively, if this information will not prove of any value, we shall remove your name from the distribution list, upon receipt of appropriate notification.

J. D. Heaman, P. Eng.,
Director,
Waste Management Branch.

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ONTARIO WATER
RESOURCES COMMISSION

ONTARIO. DEPARTMENT OF ENERGY AND RESOURCES MANAGEMENT. WASTE MANAGEMENT BRANCH.
BULL. No. 1

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DEPARTMENT OF ENERGY AND RESOURCES MANAGEMENT
WASTE MANAGEMENT BRANCH

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1 ST. CLAIR AVE. W.
TORONTO

FILE REF. No.: B. 6201

WASTE MANAGEMENT BULLETIN NO.1 - OCTOBER 1969

OPEN BURNING AT DISPOSAL SITES

It has been the practice of many municipalities in the Province to use open burning at their disposal sites as a means of reducing the volume of waste to be handled.

Recently, all municipalities operating disposal sites in Southern Ontario, at which open burning was known to be carried on, were informed by the Air Management Branch that the practice was prohibited under Section 13 of Ontario Regulation 449/67 under the Air Pollution Control Act, except with the permission of a Provincial Officer, and that the municipality was, therefore, in violation of the regulation.

Each municipality was instructed that it must submit an application within 30 days if it was intended to continue open burning. Since permission to continue burning would not be extended indefinitely, it was requested that alternative methods of disposal be investigated, and upon receipt of the application for continuance, each situation would be individually assessed by the Air Management Branch and a schedule of compliance worked out with the municipality.

A number of the municipalities affected have requested assistance from the Waste Management Branch (until September 1st, 1969 the Waste Management Section of the Public Health Engineering Service) to determine what "alternative methods of disposal" are available. The following outline of landfill disposal practices is intended as a guide only. While general

criteria can be provided, their application to a particular case requires local knowledge which can be most readily provided by Medical Officers of Health and their staff.

Basically, a landfill disposal site is an area where refuse is deposited, compacted, and sealed by a layer of earth at regular intervals. By the selection of a site in a suitable location, and good operating practices, the objectionable characteristics of a "dump" --- smell, smoke, rats and flies, and water pollution -- can be effectively eliminated.

Essentially, the cessation of open burning will result in, first, a reduction in the useful life of the site, and second, the necessity for the application of cover material at more frequent intervals. It should be noted, however, that these apparent disadvantages are only significant in the case of an open dump, where mechanical equipment is rarely used for compaction. Open burning of municipal waste is inefficient as a means of volume reduction, does not effectively eliminate putrescibles and consequently is of limited value to prevent rodent and insect infestation and may, in fact, increase the likelihood of offensive leachate and water pollution.

A more acceptable practice is open burning used only to dispose of trees and brush which have been segregated from the remainder of the waste. If an application for continuance of this practice is not approved, the only alternatives are chipping or some other acceptable methods of size reduction prior to disposal by landfill methods, or incineration in conventional or pit type incinerators with acceptable emission standards.

The requirements for the operation of a disposal site will vary depending upon the location of the site and the population served. As a very rough guide, a site serving a population of more than 2,500 should be operated as a "sanitary landfill" which requires full time supervision, with mechanical

equipment for compaction available at all times during working hours, and the refuse sealed by at least six inches of earth cover every day. If the site serves less than 1,500 people, these requirements can generally be relaxed and compaction and covering carried out at less frequent intervals.

It must be emphasized again that due to the number of factors involved, each individual case must be considered on its merits. and in the first instance the assistance of the local health unit should be obtained.

It is apparent that many municipal officials and council members are not aware of the relations between the various provincial bodies having responsibilities in the field of waste management or of the limits of these responsibilities.

The Waste Management Branch is primarily responsible for the management of all "solid wastes", which includes liquid wastes whose ultimate method of disposal is on to land.

This excludes liquid or water borne wastes which are discharged, with or without treatment, into a watercourse or other receiving body of water; such wastes are the responsibility of the Ontario Water Resources Commission.

Authority for the control of these "solid wastes" was provided originally by Bill 71, the Public Health Amendment Act 1967, under Section 95 a "Waste Disposal". Proclamation of this action, required before it became law, was not carried out, and at present there is no effective legislation controlling the management of solid wastes as a whole.

Various environmental aspects of solid waste management are controlled under other legislation:

1. If odours, particulate matter, or gases are discharged to the atmosphere "in quantities that may cause discomfort to or endanger the health or safety of persons, or that may cause injury or damage to property or to plant or animal life or that may interfere with visibility or the normal conduct of transport or business" action may be taken under the Air Pollution Control Act to prohibit the operation causing pollution or to require changes which will prevent or lessen the emmission of the contaminant.

2. If surface or ground waters used as a source of water supply are polluted, powers are available under the Ontario Water Resources Commission Act.

3. If a waste disposal area is located within the jurisdiction of a Conservation Authority, regulations made under the Conservation Authorities Act may be applicable.

4. If, in the opinion of the Medical Officer of Health, a condition exists which is or may become injurious or dangerous to health or may prevent or hinder in any manner the suppression of disease, certain powers are available to him under existing provisions of The Public Health Act.

5. Under The Municipal Act, and Schedule "B" of The Public Health Act, municipalities have limited powers to make by-laws in controlling the disposal of wastes.

When Waste Management legislation is implemented, the Branch will assume direct responsibility for the control of solid wastes.

In the meantime, a consultant and advisory service is provided in cooperation with Medical Officers of Health and their staffs, and the Branch acts as a coordinating body for the other anti-pollution agencies concerned.

Material has been prepared and is available for use by municipalities and local Health Units, providing tentative engineering standards for the location and operation of waste disposal sites including both landfill sites and incinerators; methods of assessment of permissible reductions in these standards where location, density of population, or density of development render such reductions acceptable; and the minimum standards which are necessary under the most favourable circumstances.

Advice on the selection of suitable disposal methods and sites, on operational techniques, and on the solution of particular problems can be obtained from Regional Waste Management Engineers in the field, or from Head Office in Toronto. The areas of the Waste Management Regions correspond, in general, to the boundaries of the local Health Services regions, and three of the regional offices have been in operation for the past year. These are :

SOUTHWESTERN REGION	Mr. Joseph Fetchison, Regional Waste Management Engineer, 362 Dundas Street - Suite 603, LONDON 14, Ontario. (Telephone: 519-434-4548)
MIDWESTERN REGION	Mr. Kenneth A. Childs, Regional Waste Management Engineer, 460 Main Street East, HAMILTON, Ontario. (Telephone: 416-527-3861)
CENTRAL REGION	Regional Waste Management Engineer, 8th Floor, One St. Clair Avenue West. TORONTO 190, Ontario. (Telephone: 416-365-6634)

One additional office will be operational later this year :

EASTERN REGION	Mr. Paul Davidson, Regional Waste Management Engineer, 797 Princess Street, KINGSTON, Ontario. (Telephone: 613-546-3297)

The Head Office of the Branch is located at One St. Clair Avenue West, Toronto 190, Telephone No. 416-365-6634.

ONTARIO

DEPARTMENT OF ENERGY AND RESOURCES MANAGEMENT
WASTE MANAGEMENT BRANCH

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FILE REF. No.:
B.6201

1 ST. CLAIR AVE. W.
TORONTO

WASTE MANAGEMENT BULLETIN NO. 2 - OCTOBER 1970

The Waste Management Act, 1970 became effective on September 1, 1970(1). The aim of this Legislation is to improve waste management practices and waste disposal sites to an acceptable standard which will eliminate pollution and health hazards. To this end, all waste disposal sites and waste management systems, either existing or proposed, will now require a Certificate of Approval(2). These Certificates will be issued through the Waste Management Branch of the Department of Energy and Resources Management. The Waste Management Act specifies that applications for Certificates of Approval for existing waste disposal sites and waste management systems must be submitted to the Department of Energy and Resources Management prior to March 1, 1971(3). The following summary of the main points of The Waste Management Act and the Regulation is provided for your guidance in applying for a Certificate of Approval.

The Waste Management Act and Regulation are applicable to both public and private operations(4). We would solicit the assistance of all municipalities in making the existence of The Waste Management Act and Regulation and this Bulletin known to the private operators within their municipalities. Additional copies are available from the Waste Management Branch's regional offices upon request.

A waste disposal site is defined in Section 1(m) of The Waste Management Act[5]. Essentially, it is any land or any structure where waste is deposited or processed, either for treatment or disposal. There are certain exemptions from the Act and Regulation [6] [7]. These include the storage and disposal of a householder's own domestic wastes on his own property provided that no nuisance is created; facilities governed by the Ontario Water Resources Commission Act and regulations thereunder; on-site incinerators and on-site garbage grinders.

A waste management system is defined in Section 1(n) of The Waste Management Act[8]. Essentially, it is the complete system for collecting, transporting, processing and disposal of wastes. Exceptions are works which come under the jurisdiction of the Ontario Water Resources Commission Act and regulations[9]; individual collection systems and marine-craft waste disposal systems[10].

Introduction of The Waste Management Act does not prohibit the owner from making changes in the waste disposal site operation or in the waste management system. However, effective immediately no changes of substance can be made to either sites or systems without the approval of the Minister by virtue of the issuance of a Certificate of Approval[11]. The Act does permit the Minister to order changes in any waste management system or any waste disposal site[12]. Changes might include up-grading the standard of operation, expansion of a system and even introduction of a waste management system if one does not exist and such a service is deemed to be

necessary in the public interest.

No fee will be charged for a Certificate of Approval.

Where a new site or system is to be established, prior to application to the Department for a Certificate, a notice of application must be published in the local newspaper(14). An approved format for this notice is provided with the notes on the back of the application form. It is not necessary to publish a notice for sites and systems in existence at the time of implementation of The Waste Management Act, on September 1, 1970.

The Waste Management Act requires that applicants submit certain information when applying for a Certificate of Approval. Exactly what information will be required will vary from case to case. The local Health Unit or the Waste Management Regional Engineer can advise each applicant as to the information required in each specific case(15).

Effective immediately, it is illegal to operate a waste management system, or to dispose of waste at a site, unless a Certificate of Approval has been issued, or unless the system or site was in use before September 1, 1970(16). Existing waste disposal sites and waste management systems which have not received a Certificate of Approval by March 1, 1971 will be illegal after that date. If lands or facilities are used for waste management purposes without a Certificate of Approval having been issued, the Minister may order the wastes to be removed and the site restored to a satisfactory condition(17).

Waste Management Bulletin No. 2 - Continued

The Minister may refuse to issue a Certificate of Approval for a waste disposal site or a waste management system(18). If a Certificate of Approval is refused then the applicant does have the privilege of appealing this decision to the Waste Management Advisory Board. The Waste Management Advisory Board will hear arguments for the applicant and assess the recommendation of the Branch. The decision of the Advisory Board will be reported to the Minister.

Throughout the Province, there are many waste disposal sites either filled or close to being filled. These lands cannot be used for any other purpose without the permission of the Minister for a period of twenty-five years from the time that the land ceased to be used for waste disposal purposes(19).

Certain wastes are exempted from the provisions of the Act and Regulation. These are detailed in Section 3 of the Regulation(20). It should be noted, however, that these wastes do become subject to the provisions of the Act if they are brought to a disposal site covered by the provisions of the legislation.

The standard of operation necessary for waste disposal sites will vary, depending upon the location, the population served, surrounding development, and other factors(21). Advice on satisfactory operating standards for each waste disposal site can be obtained from the local Health Unit and the Waste Management Regional Engineer. Some of the

features which will be taken into account are detailed in Sections 10, 11 and 12 of the Regulation.

The most elementary waste disposal site, the open dump, will be restricted to certain areas. These are detailed in Section 13, subsection 2 of the Regulation(22). It should be noted that even if permitted, certain minimum standards must be followed.

The standards for waste management systems are detailed in Section 14 of the Regulation(23). At present, these consist of very basic requirements for vehicles used for collection and transportation.

Application forms for waste disposal sites and waste management systems are available from the local Health Unit or from the offices of the Waste Management Regional Engineers. These forms should be completed by the applicant and submitted to the local Health Unit for transmission to the Waste Management Regional Engineers. Advice on the completion of the forms can be obtained from the Health Units or from the Regional Engineers.

The Regional Engineers of the Waste Management Branch are:

Mr. J. Fetchison, P. Eng.
Southwestern Region
Waste Management Branch
Department of Energy & Resources Management
362 Dundas Street, Suite 605
LONDON, Ontario

Waste Management Bulletin No. 2 - Continued

Mr. K. A. Childs, P. Eng.
Midwestern Region
Waste Management Branch
Department of Energy & Resources Management
460 Main Street East
HAMILTON 20, Ontario

Mr. A. D. Saunders, P. Eng.
Central Region
Waste Management Branch
Department of Energy & Resources Management
One St. Clair Ave. West, 7th Floor
TORONTO 195, Ontario

Mr. P. E. Davidson, P. Eng.
Eastern Region
Waste Management Branch
Department of Energy & Resources Management
797 Princess Street
KINGSTON, Ontario

Mr. H. F. Wright, Senior Inspector
Northern Region
Waste Management Branch
Department of Energy & Resources Management
1111 Victoria Street
THUNDER BAY, Ontario

It is anticipated that additional offices (in North Bay and Ottawa) will be staffed in the near future.

While other approvals may also be required in some instances (for example, from the Air Management Branch for a waste incinerator) the Waste Management Branch is the co-ordinating agency and will bring all applications to the attention of other regulatory agencies concerned.

Waste Management Bulletin No. 2 - Continued

It is strongly urged that in case of doubt or in a situation where interpretation of the Act and Regulation is required, then the applicant should consult with the local Health Unit or the Waste Management Regional Engineer prior to submitting the completed Application Form for approval.

Waste Management Bulletin No. 2 - Continued

REFERENCES

Reference No.	Act or Regulation Section
1	Waste Management Act, section 38
2	Waste Management Act, sections 11, 12
3	Waste Management Act, section 11, subsection (a)
4	Waste Management Act, section 1, subsection (j)
5	Waste Management Act, section 1, subsection (m)
6	Waste Management Act, section 2
7	Ontario Regulation 375/70, section 5
8	Waste Management Act, section 1, subsection (n)
8	Ontario Regulation 375/70, section 6
9	Waste Management Act, section 2
10	Ontario Regulation 375/70, section 7
11	Waste Management Act, section 12
12	Waste Management Act, sections 14, 24, 25
13	Waste Management Act, section 15
14	Waste Management Act, section 18
15	Waste Management Act, section 19
16	Waste Management Act, sections 22, 23
17	Waste Management Act, section 23
18	Waste Management Act, section 26 through 34
19	Waste Management Act, section 35
20	Ontario Regulation 375/70, section 3
21	Ontario Regulation 375/70, sections 10, 11, 12
22	Ontario Regulation 375/70, section 13
23	Ontario Regulation 375/70, section 14

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PROVINCE OF OPPORTUNITY

Environment Conservation in Ontario

Department of Energy and Resources Management

Hon. George A. Kerr, Q.C., Minister J.C. Thatcher, Deputy Minister

WASTE MANAGEMENT BRANCH
880 Bay Street Toronto 181, Ontario

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ONTARIO WATER
RESOURCES COMMISSION

BULLETIN NO. 3

The Management of Institutional Wastes

December, 1970

The Waste Management Branch is primarily responsible for the provincial control of storage, collection, transportation, treatment, and disposal of all solid wastes, and all liquid wastes which are transported by tank truck or other container to the point of treatment or disposal. Liquid waste transported by pipe or conduit is, of course, the responsibility of the Ontario Water Resources Commission.

The Branch's authority for the control of waste management practices is provided by the Waste Management Act, 1970, and an accompanying Regulation which came into effect on September 1, 1970. The Act requires the owners or operators of both collection and transportation systems, of disposal sites such as sanitary landfills, and treatment facilities such as incinerators, to obtain Certificates of Approval for their establishment and operation. Standards have been established which will ensure that all these facilities are designed, located and operated in such a way that the risk of resulting pollution, health hazard, or nuisance is reduced to a minimum.

Other Legislation Related To Waste Management

Various environmental aspects of Waste Management are also subject to control under other legislation:

1. If odours, particulate matter, or gases are discharged to the atmosphere, the source of the effluent may be subject to control under the Air Pollution Control Act. In the case of a stationery source such as an incinerator, a Certificate of Approval may be required under the Air Pollution Control Act, as well as under the Waste Management Act.

2. If pollutants are discharged either into surface or underground waters, provisions of the Ontario Water Resources Commission Act may apply.

3. If a landfill area is located within the jurisdiction of a Conservation Authority, regulations made under the Conservation Authorities Act may be applicable.

4. Under the Municipal Act, and Schedule 'B' of the Public Health Act, municipalities have limited powers to make by-laws in controlling the disposal of wastes.

5. Medical Officers of Health will have a continuing responsibility under the Waste Management Act, and by agreement with the Department of Health, Public Health Inspectors will be responsible for the day-to-day supervision in the field, supported by engineers and inspectors of the Waste Management Branch stationed at a number of regional offices throughout Ontario.

Classification of Wastes

Wastes can be classified within certain broad definitions, depending either upon their source (domestic, commercial, industrial, agricultural, institutional wastes) or upon their character (solid, liquid, hazardous, pathological, etc.).

The varied characteristics of the wastes from any individual source must be examined carefully, since they affect all aspects of

the management system - storage, collection, and transportation, as well as treatment and disposal.

Similarly, it is not possible to study, for example, the disposal of wastes in isolation. Each aspect is interrelated with the others, and an effective solution to a disposal problem is unlikely to be found without investigating the entire system as one entity, giving due weight to all the factors involved. This is particularly significant in regard to institutional wastes where waste management practices within the institution may have an overriding effect upon the selection of most effective and economic methods of collection, treatment, and disposal.

Types of Institutional Waste

From our point of view, institutional waste can be divided into three principal categories:

1. General Refuse
2. Hazardous Waste
3. Pathological Waste

General Refuse

The refuse from an institution is essentially similar to municipal refuse. It includes food wastes which are putrescible; non-putrescible wastes, such as wood, paper, and packing materials which are combustible; and others which are non-combustible or should not be incinerated, such as glass, metals, and some plastics.

The changes which have taken place in institutional refuse in recent years correspond with the trend recognized for municipal waste, but to an exaggerated degree. The waste generated by the hospital patient appears to be about four times that discarded by the average householder. U.S. figures show about nineteen pounds daily for each

hospital patient, while the corresponding average figure for municipally collected waste is about five pounds per person. Moreover, the amount of waste produced per patient per day has increased more than five times since 1955, when a total of only 3.9 pounds was reported by the American Public Health Association.

The increase appears largely due to the wide acceptance of disposable and single use articles of all types, but a substantial increase in the relative proportion of packaging materials is also evident.

There are obvious reasons for this increased acceptance of disposable materials: the control of infection, and economy, particularly economy of labour. In connection with the latter, it should be pointed out that unless the internal hospital waste management systems are carefully designed and automated, this economy may prove more apparent than real.

Hazardous Waste

The category of hazardous wastes includes such items as discarded syringes and needles, pharmaceutical materials, aerosol cans and, of course, radioactive material.

Pathalogical Waste

Pathological waste is inherently hazardous and results from the discard of tissue, or of material or equipment subject to contamination with infectious organisms. In this connection, the precise definition of pathological waste may be varied to some degree depending upon the effectiveness of the management procedures for separation of contaminated wastes within the hospital, and to some degree upon the method of treatment and disposal.

Management of Institutional Wastes

In general, institutional refuse offers the same management problems as municipal waste, providing that adequate management practices are developed within the hospital for the separation of pathological and hazardous wastes with adequate safeguards against cross contamination. Certain items included under hazardous waste may be handled with the general refuse, providing preliminary treatment is given, for example, by the use of syringe and needle crushers.

The importance of internal management practices cannot be overemphasized and affect every element of the waste management system, both inside and outside the institution. None of the systems of internal management, and particularly internal transport, at present in use are completely satisfactory, and research and development work in this field is urgently required.

The standard cart system for collection and transportation of wastes is still used in the majority of hospitals. Gravity chutes are also used to some extent and properly designed chutes should not present fire hazards. Both methods have undesirable features and may contribute to contamination of the environment, though in both cases this risk can be very much reduced by ensuring that all wastes are packaged at the source. Packaging has many other advantages, and the use of distinctive containers can aid materially in separation procedures.

Pneumatic collection is a development which should be seriously considered in all institutions at the design stage. Such a system reduces the amount of physical handling and can incorporate air filtration to eliminate the possibility of environmental contamination.

Wet grinding, or pulping, which will be discussed under treatment methods in greater detail, can be incorporated into a piped waste

collection system. However, its advantages for collection would be dependent on the location of a number of units throughout the facility.

Setting aside for the moment the question of storage and collection, it is important to realize that landfill is the only complete method of disposal available. All other methods are essentially treatment to improve the characteristics of the waste or achieve volume reduction. Even with the most efficient incineration, for example, there is an irreducible residue of non-combustible material and ash which must be disposed of by landfill.

Treatment methods available at present include, singly or in combination, dry grinding, wet grinding, compression into blocks, and incineration.

The collection of swill for hog feeding, though still practiced in some institutions, is unsatisfactory for many reasons and should be discouraged. While these wastes must be cooked before feeding to animals, unless the entire operation is under the institutions control, effective supervision is difficult. Storage and handling, moreover, is a major problem, and although the haulage of swill will be regulated under the Waste Management Act, the use of suitable containers will undoubtedly result in higher costs.

The majority of larger institutions, both in Canada and the U.S., have used incinerators to treat their solid wastes. Very few of these incinerators could be considered satisfactory, either from the viewpoint of efficient combustion or reduction of air pollution. Unfortunately, while a number of incinerator designs can achieve the maximum of solids reduction with a minimum of air pollution, they are economic only when serving very large populations. Unquestionably, an incinerator of suitable design remains the only satisfactory solution for the disposal of pathological waste, and a number of approved designs providing sufficiently high temperatures and adequate retention time for the

destruction of pathogens are available. Again, however, the use of such an incinerator to deal with all hospital wastes would be uneconomic, except in special circumstances.

If a suitable municipal incinerator is available, its use would probably be preferable for the disposal of the institutional wastes. If a new municipal incinerator is under design, it may be possible to incorporate facilities for the incineration of pathological wastes from the institutions in the area. This approach would solve a troublesome problem for municipalities by providing facilities for the disposal of dead animals.

As already mentioned, up to ten per cent of hospital wastes are not incinerable, and these, with the residual ash and fly-ash, must be ultimately disposed of by landfill.

Wet grinding in a water stream and subsequent discharge to a sanitary sewer is undoubtedly the most effective method of dealing with swill and other organic wastes. When considering this method, the institution's sewerage system must be examined to ensure that it is of sufficient capacity to take the increased solid load, and similarly the sewage treatment plant receiving the sewer discharge must be of adequate capacity to deal with both the increased solid and B.O.D. load. Since the majority of putrescible material can be fed to the grinder, the handling and disposal of the remainder of the waste is very much simplified.

Wet grinding followed by compression can deal with both the food wastes and much of the general refuse. In this system, the waste is ground in a water stream, and may at the same time be disinfected, and is then compressed and extruded into blocks of comparatively high density. The compression releases liquid and although this is recirculated to the grinder, the surplus must be discharged to a sewerage system and since it is high in solids and B.O.D. similar

precautions as previously described must be taken. The transport and disposal of the compressed blocks is, of course, very much simplified. It may enable less frequent collections to be feasible, but whether the transportation of the blocks will result in an economy will depend upon the type of vehicle used; for example, the increased density may mean that a full vehicle load cannot be carried due to weight restrictions.

Equipment incorporating dry grinding with some degree of compression has been developed primarily to deal with waste from apartment houses, and further development may make it applicable to institutional refuse.

A number of other treatment methods are at present under development, but claims for new processes or equipment are often exaggerated and very great caution must be exercised in their acceptance. It must be emphasized once again that no single element of a waste management system can be examined in isolation. A single process unit may, in itself, be efficient and economic, but its use in a particular instance could well result in increased overall cost.

Composting, and in general separation and re-cycling of the various components of refuse, is philosophically the most acceptable method of waste disposal. At present, practical and technological problems prevent its acceptance as a reliable alternative to existing methods. Should a re-cycling and composting plant be established by a municipality, additional problems may result for the institutions in the area. An experimental compost plant at Johnson City, Tennessee, has found it necessary to stop accepting wastes from the local hospital.

Any sanitary landfill site approved by the Waste Management Branch is a perfectly acceptable method of disposal of general institutional refuse, and with adequate pretreatment, for certain materials classified as hazardous. Approval of a sanitary landfill site implies that the waste is compressed into cells by mechanical

equipment and the cells surrounded daily by six inches of suitable earth; that the site is located and designed to minimize the risk of contamination of ground or surface waters; and that adequate measures of supervision and control are provided at all times.

Modified landfills or dumps are not acceptable for the disposal of any institutional waste.

No landfill site is acceptable for the disposal of pathological waste. However, as already mentioned, certain wastes which may be included in a general definition as pathological, but where only a limited hazard of possible contamination with infectious organisms is incurred, and where adequate assurance is available that separation procedures in the institution are organized and maintained at a high standard, may be acceptable at certain selected landfill sites. Characteristics of such sites would include geological conditions which eliminate hazard to ground water aquifers, provision for the collection and treatment of leachate, and the provision of monitoring facilities.

Landfill disposal is most unlikely to be operated by the institution itself, or even by a group of institutions, and municipal or private disposal facilities will almost invariably be utilized.

The method used for bulk storage and collection of institutional refuse will depend largely upon the means of waste transportation used. If the institution operates its own incinerator, frequent collection is feasible and the storage requirements minimized. Comparatively simple transportation methods could be used, and possibly, with pneumatic collection, eliminated.

If the waste is to be collected by a municipality or private contractor, the use of containers, possibly with a stationery compactor to reduce volume, should be given serious consideration, and will almost certainly enable less frequent collections to be feasible.

It is difficult to lay down general criteria for these aspects of institutional waste management, since so many factors are involved, ranging from procedures within the hospitals to the location and type of disposal. This is particularly true in Ontario at present where only a limited number of municipalities and private contractors operate completely satisfactory collection and disposal systems. It is anticipated that with the introduction of the Waste Management Act, this situation will change rapidly over the next few years, that more suitable equipment and management practices will be introduced, and that, in particular, a greater number of landfill sites and municipal incinerators will become available for institutional use.

There is no simple solution to the problems of institutional waste management. As has been repeatedly emphasized throughout this paper, management practices within the institution have an overriding effect upon both the safety and the economy of the collection and disposal of the institution's waste.

An essential first step in the development of improved practices is a detailed survey and a critical evaluation of existing practices.

The management of waste within the hospital is outside the jurisdiction and control of the Waste Management Act, though the Branch must obviously be concerned since poor management inside the hospital inevitably results in problems of collection and disposal which are, of course, the responsibility of the Branch. Co-operation certainly will be provided to the fullest extent possible, within the limits of our present staff and resources, in developing criteria for the necessary surveys and advising on the additional investigation and research which is undoubtedly urgently required in this field.

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